

Appl. No. 09/670/870
Amdt. Dated August 11, 2005
Reply to Office Action of 4/11/05

Docket No. CM00914S
Customer No. 22917

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (original) An echo canceling method, the method comprising the steps of:
 - determining an Euclidean norm of an echo-replica signal;
 - determining an Euclidean norm of an input signal;
 - determining a gradient step size;
 - correcting the coefficients of an adaptive filter;
 - deriving an updated echo-replica signal, and
 - determining an updated error signal by subtracting said updated echo-replica signal from said input signal.
2. (original) The method according to claim 1, wherein said echo replica signal is produced by processing a reference far-end signal with an adaptive filter.
3. (original) The method according to claim 1, wherein said input signal includes at least one of the list consisting of:
 - an echo-signal;
 - a near-end speech signal, and
 - a noise signal.
4. (original) The method according to claim 1, wherein said gradient step size is a function of said Euclidean norms of said echo-replica and input signals.
5. (original) The method according to claim 4, wherein the value of said function decreases when the values of said near-end speech and noise signals increase, and wherein the value of said function increases when the values of said near-end speech and noise signals decrease.

Appl. No. 09/670/870
Amdt. Dated August 11, 2005
Reply to Office Action of 4/11/05

Docket No. CM00914S
Customer No. 22917

6. (original) The method according to claim 1, wherein the correction of said coefficients of said adaptive filter is performed by employing said gradient step size, said reference far-end signal and an error signal, said error signal determined at the previous adaptation step.

7. (currently amended) Echo canceling apparatus, comprising:

a signal processor, wherein said signal processor determines an Euclidean norm of an echo-replica signal and determines an Euclidean norm of an echo-replica signal;

an adaptation control unit, connected to said signal processor;

an adaptive filter, connected to said signal processor and to said adaptation control unit,

and

a subtractor, connected to said signal processor, to said adaptation control unit and to said adaptive filter.

8. (cancelled)

9. (cancelled)

10. (currently amended) The echo canceling apparatus, according to claim 7-claim 8, wherein said echo replica signal is produced by processing a reference far-end signal with said adaptive filter.

11. (currently amended) The echo canceling apparatus, according to claim 7-claim 9, wherein said input signal includes at least one of the list consisting of:

an echo-signal;

a near-end speech signal, and

a noise signal.

12. (original) The echo canceling apparatus, according to claim 7, wherein said adaptation control unit determines a gradient step size.

Appl. No. 09/670/870
Amdt. Dated August 11, 2005
Reply to Office Action of 4/11/05

Docket No. CM00914S
Customer No. 22917

13. (original) The echo canceling apparatus, according to claim 12, wherein said gradient step size is a function of said Euclidean norms of said echo-replica and input signals.
14. (original) The echo canceling apparatus, according to claim 13, wherein the value of said function decreases when the values of said near-end speech and noise signals increase and wherein the value of said function increases when the value of said near-end speech and noise signals decrease.
15. (original) The echo canceling apparatus, according to claim 7, wherein said adaptation control unit corrects the coefficients of said adaptive filter.
16. (original) The echo canceling apparatus, according to claim 15, wherein said correction of said coefficients of said adaptive filter is performed by employing said gradient step size, said reference far-end signal and an error signal, said error signal determined at the previous adaptation step.
17. (original) The echo canceling apparatus, according to claim 7, wherein said adaptive filter derives an updated echo-replica signal.
18. (currently amended) The echo canceling apparatus, according to claim 17 ~~claim 7~~, wherein said subtractor subtracts said updated echo-replica signal from said input signal and derives an updated error signal thereof.
19. (currently amended) The echo canceling apparatus, according to claim 7, further comprising ~~a digital-to-analog~~ an analog-to-digital converter, connected to said signal processor, to said subtractor and to a source of said input signal.
20. (original) The echo canceling apparatus, according to claim 19, wherein said analog-to-digital converter converts an analog input signal into a digital input signal.
21. (currently amended) Echo suppression method comprising the steps of:

Appl. No. 09/870/870
Amdt. Dated August 11, 2005
Reply to Office Action of 4/11/05

Docket No. CM00914S
Customer No. 22917

estimating an amplitude measure of a reference far-end signal;
estimating an amplitude measure of an error signal, wherein said far-end signal and said error signal, are digital signal blocks, each said digital signal block containing at least two digital samples and estimating said amplitude measure of said far-end signal comprises summing said absolute value of said at least two samples corresponding to said far-end signal, and estimating said amplitude measure of said error signal comprises summing said absolute values of said at least two samples corresponding to said error signal;
comparing between the values of said amplitude measures of said far-end and said error signals, thereby producing a comparison value; and
analyzing said comparison value, thereby producing a control signal.

22. (original) The echo suppression method, according to claim 21, wherein said error signal is received from an echo cancellation system.

23. (cancelled)

24. (original) An echo suppression method comprising the steps of:

producing at least two far-end signal amplitude measure values by estimating an amplitude measure of a reference far-end signal, wherein said reference far-end signal is a sequence of at least two digital signal blocks, each said digital signal blocks contains at least one digital sample;

producing at least two error signal amplitude measure values by estimating an amplitude measure of an error signal, wherein said error signal comprises a sequence of at least two digital signal blocks, each said digital signal block contains at least one digital sample;

determining a plurality of value pairs, each said pair including a selected one of said at least two error signal amplitude measure values and a respective one of said at least two far-end signal amplitude measure values;

comparing between said far-end signal amplitude measure value and said error signal amplitude measure value, within each said value pairs, thereby producing at least two comparison results;

analyzing said at least two comparison results, thereby producing a control signal.

Appl. No. 09/870/870
Amdt. Dated August 11, 2005
Reply to Office Action of 4/11/05

Docket No. CM00914S
Customer No. 22917

25. (currently amended) Echo suppression apparatus comprising:

a first amplitude estimation unit that estimates an amplitude measure of a reference far end signal;

a second amplitude estimation unit that estimates an amplitude measure of an error signal, wherein said far-end signal and said error signal, are digital signal blocks, each said digital signal block containing at least two digital samples and estimating said amplitude measure of said far-end signal comprises summing said absolute value of said at least two samples corresponding to said far-end signal, and estimating said amplitude measure of said error signal comprises summing said absolute values of said at least two samples corresponding to said error signal;

a comparison unit, connected to said first amplitude estimation unit and to said second amplitude estimation unit; and

a decision logic unit connected to said comparison unit.

26. (cancelled)

27. (cancelled)

28. (currently amended) The echo suppression apparatus, according to claim 25,

~~wherein said first amplitude estimation unit estimates an amplitude measure of a reference far end signal,~~

~~wherein said second amplitude estimation unit estimates an amplitude measure of an error signal, and~~

wherein said comparison unit compares between the values of said amplitude measure of said far-end signal and said amplitude measure of said error signal and produces a comparison result thereof.

29. (original) The echo suppression apparatus, according to claim 28, wherein said decision logic unit analyzes said comparison result and produces a control signal thereof.

Appl. No. 09/870/870
Amdt. Dated August 11, 2005
Reply to Office Action of 4/11/05

Docket No. CM00914S
Customer No. 22917

30. (currently amended) The echo suppression apparatus, according to claim 25 ~~claim 27~~, wherein said error signal is an output of an echo cancellation system.

31. (cancelled)

32. (currently amended) Echo suppression apparatus, comprising:

a first amplitude estimation unit ;

a second amplitude estimation unit, wherein said first amplitude estimation unit produces at least two far-end signal amplitude measure values by estimating an amplitude measure of a reference far-end signal, wherein said reference far-end signal is a sequence of at least two digital signal blocks, each said digital signal block contains at least one digital sample;

a comparison unit, connected to said first amplitude estimation unit and to said second amplitude estimation unit;

a delay unit, connected to said comparison unit; and

a decision logic unit, connected to said delay unit.

33. (cancelled)

34. (original) The apparatus for echo suppression, according claim 32, wherein said second amplitude estimation unit produces at least two error signal amplitude measure values by estimating an amplitude measure of an error signal, wherein said error signal is a sequence of at least two digital signal blocks, each said digital signal block contains at least one digital sample.

35. (currently amended) The apparatus for echo suppression, according to claim 34 ~~claim 32~~, wherein said comparison unit determines a plurality of value pairs, each said pair including a selected one of said at least two error signal amplitude measure values and a respective one of said at least two far-end signal amplitude measure values, compares between said far-end signal amplitude measure value and said error signal measure value, within each said value pairs and produces at least two comparison results thereof.

Appl. No. 09/670/870
Amdt. Dated August 11, 2005
Reply to Office Action of 4/11/05

Docket No. CM00914S
Customer No. 22917

36. (original) The apparatus for echo suppression, according to claim 35, wherein said delay unit stores said at least two comparison results.

37. (original) The apparatus for echo suppression, according to claim 36, wherein said decision logic unit analyzes said at least two comparison results and produces a control signal thereof.